

The effect of wall thickness, mullions, and exterior surfaces on day lighting.

The Daylight Distributions at 2 ft increments for a 30 x 30 x 10 ft room that has a 27 ft wide x 5 ft window (rough opening size) extending from 3.5 to 8.5 ft. high on a north-facing exposure were analyzed. The illuminance along two lines perpendicular to the window, at the room centerline and at 4 feet from the side wall were graphed.

Material Properties:

The glass transmittance is 50%.

Room reflectance: 90/60/20 (ceiling, wall, floor) and the mullions are 30% reflective.

This study was conducted using a 45-degree solar profile angle at solar noon under a clear sky at 40 N latitude.

The four cases (listed as “parts” in the graph below) considered were the following:

1. The room walls as a single polygon – no thickness, with no mullions.
2. A wall thickness of one foot.
3. A wall thickness of one foot plus mullions that are three inches wide by 6 inches deep, with a frame that is half the mullion width used along the window perimeter. The full window is dividing into five pieces across the window wall and is flush with the interior wall.
4. In addition to one foot wall thickness and mullions, a ground plane of 9% reflectance extending 30 feet out from the façade, along with a 40% reflective façade that extends 50 feet below the limits of the window wall and four feet above it was analyzed.

Summary of Results

	Illuminance	% Change
Thin Wall	55.7	
1ft Wall	49.7	11%
Mullions	46.8	6%
Everything	23.7	49%

